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RESEARCH ARTICLE

Effectiveness of the Concrete-Representational-Abstract (CRA) Approach in Enhancing Addition and Subtraction Skills among Early Grade Learners in Ubungo Municipality, Tanzania

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Author's Contributions

All authors contributed equally to this research.

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ABSTRACT

The study assessed the effectiveness of the concrete-representational abstract (CRA) strategy in improving addition and subtraction skills of early grade learners in Ubungo Municipality, Tanzania. The study was guided by the constructivist learning theory and used a mixed method sequential explanatory design. The population of the study was 796 respondents from which a sample of 126 respondents was selected. These respondents were divided into 100 Standard Two pupils, 22 teachers, and four head teachers. Questionnaires, interviews, observations, and documentary reviews were used to collect data. The statistical tools used to analyze the quantitative data were frequencies, percentages, means, and standard deviation using SPSS Version 28 while the qualitative data were thematically analyzed. The study revealed that most teachers agreed that CRA was effective in promoting addition and subtraction skills of pupils in Standard Two. Specifically, 90.9% of teachers agreed or strongly agreed that the use of concrete materials in CRA helped pupils to acquire addition and subtraction concepts while 86.4% reported that the use of visual representations improved pupils' performance on addition and subtraction. Similarly, 86.4% of the teachers agreed or strongly agreed that the transition from concrete materials to abstract symbols helped pupils to improve their understanding of mathematics while 86.4% of teachers agreed or strongly agreed that the CRA approach improved pupils' accuracy in addition and subtraction. Additionally, 81.8% of teachers agreed or strongly agreed that regular use of CRA approach increased pupils' confidence and participation levels during mathematics lessons. The interview results also revealed that the pupils benefited from using locally available materials and visual representations, teacher assistance and transition to abstract mathematical symbols. However, the study also revealed that there is a shortage of effective early grade numeracy strategies. This was evident by the fact that 73% of the teachers interviewed had not received recent training on early grade mathematics learning. The study concluded that the CRA is an effective learner-centered strategy for improving addition and subtraction skills of Standard Two learners if it is regularly used together with teachers' assistance and instructional materials. The study recommended frequently conducting teacher training on CRA in improving early-grade numeracy, providing and encouraging frequent use of locally available instructional materials and reinforcing learning mathematics by using the CRA instructional materials at school level.

Keywords: Concrete-Representational-Abstract (CRA) Approach, Addition and Subtraction, Skills and Early Grade Learners

INTRODUCTION

The Concrete-Representational-Abstract (CRA) approach is an instructional strategy used to help learners develop mathematical understanding by progressing from practical experiences to visual representations and, finally, to abstract mathematical symbols. In the concrete stage, learners use physical objects such as counters, sticks, bottle tops, blocks, or other locally available materials to explore mathematical concepts. In the representational stage, learners use pictures, diagrams, number lines, or other visual models to represent what they have experienced with the concrete materials. In the last stage of the CRA model, learners engage with numbers, signs, and symbols independently. This progression facilitates learners' ability to connect tangible concepts to abstract mathematical ideas (Flores & Hinton, 2022).

The CRA model is relevant to learning addition and subtraction in early grades since these concepts require developing an understanding of a relationship between quantities rather than simply memorizing the process. For instance, learners can use manipulatives to model addition and subtraction concepts and then use pictorial representations to depict them mathematically. Kaya and Guner-Yildiz (2024) found that CRA intervention was effective in instructing a young learner in basic addition and subtraction and tens-and-ones ideas. Likewise, Hinton and Flores (2022) explicated that CRA integrated with manipulatives, pictorial representations, and numbers could be an intervention for learners in need of additional support in mathematics.

Across the globe, there has been an increased emphasis on the quality of early-grade mathematics instruction due to the foundational nature of mathematics literacy and its importance in everyday life. Additionally, addition and subtraction are fundamental mathematical concepts that support learners' understanding of number relations, place value, problem-solving, and higher-order operations. Nevertheless, young learners face several challenges when these concepts are introduced in the classroom using abstract notations without relating them to concrete experiences. Flores and Hinton (2022) posit that CRA model's sequence allows learners to encounter concepts in different representations and support conceptual understanding and mathematical reasoning. Similarly, Bania and Hota (2026) revealed that primary-school teachers considered CRA-based instruction appropriate to foster conceptual understanding, learner engagement, and participation. Further, empirical studies report the effectiveness of CRA in mathematics instruction. For instance, Ebner et al. (2025) analyzed 30 single-case studies on CRA mathematics intervention using a meta-analytic review. They found a significant overall effect of CRA intervention on learners' achievement and explicated that this approach progresses from concrete to representational to abstract stages. Hence, teachers

should incorporate CRA-based instruction to improve learners' achievement in mathematics by deliberately connecting different stages of instruction instead of presenting them independently.

In Africa, there is also growing evidence on the effectiveness of CRA intervention in improving numeracy achievement among primary-school learners. For example, Obafemi (2023) conducted an experimental study to determine the effect of CRA on pupils' numeracy performance in Moro Local Government Area, Kwara State, Nigeria. It adopted a pre-test, post-test, non-equivalent control-group quasi-experimental design. The study found that CRA had a substantial effect on pupils' numeracy performance and could be used to improve numeracy achievement in primary schools. This study indicates that CRA intervention can be applicable in Tanzania since it shares similar sociocultural factors as Nigeria. Besides, CRA can be relevant in Tanzania because it can use locally available and affordable materials to facilitate learners' concrete experiences with mathematical concepts before introducing abstract representations. However, successful implementation of CRA intervention requires addressing several barriers related to teachers' pedagogical knowledge, availability of teaching materials, lesson planning, and time. For instance, Bania and Hota (2026) revealed that training, time, lesson planning, and material management were limitations to implementing CRA-based instruction. Therefore, although the reviewed literature indicates the potential effectiveness of CRA intervention, its success in Tanzania depends on contextual factors.

Despite the global and regional evidence on the effectiveness of CRA intervention, there is limited information on its effectiveness in Tanzanian early-grade learners. Most of the reviewed literature used foreign populations rather than Tanzanian early-grade learners. Further, the influence of CRA-based instruction on addition and subtraction is unclear since some of the reviewed literature used various intervention strategies. This is a significant gap in the literature, considering that addition and subtraction are the basis for higher-order mathematical concepts. Additionally, the studies do not report whether addition and subtraction can be effectively learned using CRA model. Even though Kaya and Guner-Yildiz (2024) studied the efficacy of CRA intervention in early grades and discovered that it was effective for addition and subtraction, Ebner et al. (2025) found that CRA intervention could be effective to teach various mathematical skills and concepts. Nevertheless, these studies failed to explicitly examine CRA intervention in the Tanzanian context.

LITERATURE REVIEW

Theoretical Review

The study adopted the Constructivist Learning Theory developed by Piaget (1952) and Vygotsky (1978) and

supported by Kolb's Experiential Learning Theory (1984) to guide the research. Constructivism views learning as a purposeful activity where learners construct knowledge through experience and social interaction with the environment. Piaget's theory provides an insight into how learners acquire knowledge and states that teachers should provide opportunities for learners to interact with concrete objects before introducing abstract concepts. According to Vygotsky's theory, teachers should facilitate cognitive development through contextual information and interactions with more experienced others. It further states that learners construct knowledge through observation, collaboration, and social interactions. Kolb's theory highlights the importance of concrete experiences, reflections, abstract conceptualization, and experimentation when acquiring knowledge. Therefore, the CRA intervention aligns with the constructivist approach since it progresses from concrete learning to abstract concepts and provides a context for learners to engage with concrete materials to develop an understanding of addition and subtraction and use such concepts to perform calculations. The theory is useful to this study because it explains how early-grade learners can develop an understanding of addition and subtraction using concrete materials, pictorial representations, teacher assistance, and abstract mathematical symbols. The limitation of this theory is that it can be too demanding for teachers to implement in large classes with limited teaching time and materials.

Empirical Literature Review

The reviewed literature indicates that different learner-centered and innovative strategies can be effective in early-grade mathematics instruction. However, there is limited information on the effectiveness of a concrete-representational abstract (CRA) intervention for addition and subtraction. Bang and Flynn (2024) conducted an experimental study to assess the influence of adaptive game-based learning on early-grade mathematics learning, personalized learning, and mathematics anxiety in the US. The study found that game-based learning had a significant effect on early-grade achievement, personalized learning, and reduced mathematics anxiety. Nonetheless, the study did not report how cost-effective game-based learning could be in settings with insufficient resources. On the other hand, Mustika et al. (2025) conducted a systematic review of early mathematics intervention studies and identified effective strategies for developing numeracy skills in Indonesia. The review revealed that concrete manipulatives, visual representations, corrective feedback, explicit instruction, parental involvement, and game-based learning were effective in improving early numeracy. However, it did not report empirical evidence on the effectiveness of CRA intervention.

Hamukonda and Luneta (2023) conducted a survey to determine the role of instructional strategies in improving mathematics achievement in Grade 1 in Namibia. The study found that teachers relied mainly on conventional instruction, such as rote counting and oral stories, rather than using manipulatives and games. It further recommended that teacher professional development programs should emphasize the use of interactive methods and materials. This study does not specifically address the effectiveness of CRA intervention in addition and subtraction. Instead, it recommends that teachers should use different strategies to make the subject matter interesting. Obi and Iwuanyanwu (2023) conducted a survey to assess alternative assessment strategies in mathematics instruction. The study found that using projects, quizzes, practical assessments, and exploratory tasks yielded better results than traditional assessment methods. However, it does not discuss effective instructional strategies for addition and subtraction. It focuses on assessment strategies suitable for upper primary-school learners rather than early-grade learners.

Kikomelo et al. (2025) conducted a survey to evaluate the perception of secondary-school learners towards problem-based learning in Tanzania. The study found that problem-based learning was effective in promoting critical thinking, engagement, and collaboration. However, it further revealed that inadequate teacher readiness, resources, and instructional materials limited the implementation of this approach. Although this study shows the importance of using learner-centered strategies, it does not specifically discuss the relevance of CRA intervention. Additionally, it focuses on the secondary-school level rather than the early grades. Overall, these studies reveal that different innovative strategies can be effective in mathematics instruction. Nevertheless, they do not discuss the effectiveness of CRA intervention in detail. However, Concrete-Representational-Abstract based instruction and other learner-centered strategies have been found effective in improving numeracy skills among learners. For instance, Ebner et al. (2025) reveal that CRA intervention has a significant effect on learners' mathematics achievement, particularly with regard to addition and subtraction. The study further shows that CRA-based instruction can foster abstract thinking and conceptual understanding of numerical relations. Likewise, Mancl et al. (2012) found that CRA intervention had a significant effect on learners' addition and subtraction skills. In a related study, Flores (2010) established that CRA intervention was effective in helping learners at risk of developing mathematics disabilities learn subtraction. In Tanzania, Lee and Choi (2020) conducted an experimental study to evaluate the efficacy of early numeracy intervention in promoting addition and subtraction skills among early-grade learners. The study found that targeted intervention

could improve skills, reasoning, and numeracy, especially in Grade 1. However, it does not discuss the effectiveness of CRA intervention.

METHODOLOGY

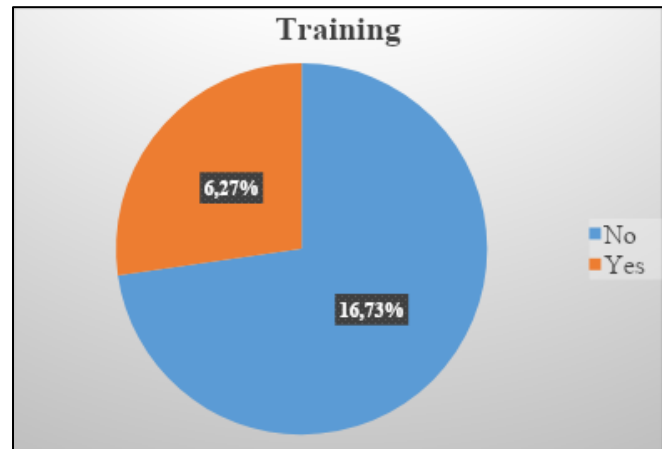
This study adopted a mixed-methods sequential explanatory design to answer the research questions. In this design, quantitative data were collected and analyzed first, and qualitative data were used to explicate the quantitative results (Creswell & Creswell, 2018). The study was conducted in Ubungu Municipality in Dar es Salaam Region. The population included 714 Standard Two pupils, 78 teachers, and four head teachers, making a total of 796 participants. From the population, a sample of 126 respondents was selected. The respondents included 100 Standard Two pupils selected using a simple random sampling technique, 22 teachers selected using a purposive sampling technique, and four head teachers selected using a total sampling technique. Data were collected using questionnaires, interviews, observations, and documentary reviews. Prior to data collection, the research instruments were subjected to validity and reliability tests. The validity of the instruments was established through expert review and pilot testing. On the other hand, the reliability of the questionnaire was tested using Cronbach's Alpha, with items having a reliability index of 0.70 and above being considered reliable. The collected data were analyzed using SPSS Version 28 and descriptive statistics, including frequencies, percentages, means, and standard deviation for the quantitative data. Thematic analysis was used to analyze the qualitative data. Additionally, the qualitative findings were integrated with the quantitative results to provide comprehensive results that answer the research questions. Ethical principles were also observed by obtaining research permission, informed consent, ensuring voluntary participation, maintaining confidentiality and anonymity, and protecting participants' rights throughout the study (BERA, 2018).

FINDINGS AND DISCUSSION

This study focused on how the use of Concrete-Representational- Abstract (CRA) influences pupils' ability to perform addition and subtraction. The study collected data from teachers and Head teachers through questionnaires and interviews. The findings are presented in themes that reflect the study questions, followed by interpretation and discussion.

Teachers' Training

The first question asked of teachers focused on whether they attend any training on teaching Arithmetic, and their response presented in Figure 1



Source: Researcher (2026)

Figure 1. Teachers' Training (n=22)

Figure 1 indicates the findings presented in Figure 1 indicate that out of the 22 teachers who participated in the study, 16 teachers (73%) reported that they had not received recent training related to teaching approaches for early-grade numeracy, while only 6 teachers (27%) reported that they had received such training. The finding reflects the existence of a major deficit in terms of continuous professional development on the part of the teachers in charge of numeracy at the early grades. This finding is very significant as the Tanzania Institute of Education (TIE) recognizes teachers as the major players in the process of curriculum implementation. The Standard One–Two curriculum specifically emphasizes the development of literacy and numeracy competencies, requiring teachers to use appropriate teaching and learning strategies to support learners' acquisition of these foundational skills (Tanzania Institute of Education [TIE], 2025). Therefore, the fact that 73% of the teachers had not received recent training suggests that a large proportion of teachers may not have adequate opportunities to update their pedagogical knowledge and skills in line with current curriculum expectations.

The finding also has direct implications for the implementation of the Concrete-Representational-Abstract (CRA) approach examined under the first objective. The TIE curriculum expects teachers to plan and teach in ways that enable pupils to build competencies and to prepare and use appropriate teaching and learning materials. Effective implementation of CRA similarly requires teachers to guide pupils progressively from concrete materials, through representations, to abstract mathematical symbols. Therefore, the limited access to recent professional development reported by the majority of teachers may constrain their ability to implement such learner-centred approaches systematically and effectively. This interpretation is further supported by the Ministry of Education, Science and Technology,

which identifies continuous teacher professional development as an important component of improving the implementation of the competence-based curriculum. Therefore, the result does not only reveal the lack of training but also suggests a possible gap between the demands of implementing the curriculum and professional development opportunities for the teachers in the sample schools. Strengthening regular, curriculum-focused professional development in early-grade numeracy could therefore help teachers acquire and update the practical skills needed to implement CRA and other learner-centred approaches effectively.

The Effect of Concrete- Representational- Abstract (CRA) and Pupils' Ability to Perform Addition and Subtraction

This is the second question, which asked about the effect of the Concrete-Representational-Abstract (CRA) approach on pupils' ability to perform addition and subtraction among early-grade learners in Ubungo Municipality. The findings were obtained from questionnaires administered to 22 teachers using a five-point Likert scale, where 1 represented Strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree, and 5 Strongly Agree. The findings focused on the use of concrete materials, visual representations, and abstract mathematical symbols in supporting pupils' understanding and performance of addition and subtraction. The quantitative findings were complemented by information obtained through interviews.

Table 1. Teachers' Responses on the Effect of the CRA Approach on Pupils' Ability to Perform Addition and Subtraction (n = 22)

Statements	SD F (%)	D F (%)	N F (%)	A F (%)	SA F (%)
Use of concrete materials helps pupils understand addition and subtraction	0 (0.0)	1 (4.5)	1 (4.5)	8 (36.4)	12 (54.5)
Visual representations, pictures and drawings improve pupils' ability	0 (0.0)	1 (4.5)	2 (9.1)	9 (40.9)	10 (45.5)
Progressing from concrete materials to abstract symbols improves pupils' understanding of mathematical operations.	1 (4.5)	1 (4.5)	1 (4.5)	8 (36.4)	11 (50.0)
The CRA approach improves pupils'	0 (0.0)	2 (9.1)	1 (4.5)	10 (45.5)	9 (40.9)

accuracy when performing addition and subtraction.

Regular use of the CRA approach enhances pupils' confidence and participation	1 (4.5)	1 (4.5)	2 (9.1)	9 (40.9)	9 (40.9)
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Source: Field Data (2026)

The findings in Table 1 indicate that the majority of teachers agreed that the Concrete-Representational-Abstract (CRA) approach positively affected pupils' ability to perform addition and subtraction. Teachers generally believed that the use of physical objects enabled pupils to understand mathematical concepts through practical experiences before moving to pictures, drawings, numbers, and mathematical symbols. The high levels of agreement further suggest that the systematic movement from concrete experiences to visual representations and finally to abstract operations supported pupils in developing conceptual understanding, accuracy, confidence, and active participation when solving addition and subtraction problems.

Use of concrete materials helps pupils understand addition and subtraction concepts

The findings show that 20 teachers (90.9%) agreed or strongly agreed that using concrete materials helped pupils understand addition and subtraction concepts, including 12 teachers (54.5%) who strongly agreed and 8 (36.4%) who agreed. Only one respondent disagreed (4.5%) and another was neutral (4.5%). In the course of the interview, one of the respondents argued that:

"By allowing pupils to use bottle tops, sticks, stones, counters, and other available materials, they understand addition and subtraction much better. Pupils are able to add or subtract things rather than just numbers by doing so. It becomes easier to comprehend and remember the meanings of mathematical operations." (Interview B, June 2026)

It implies that concrete materials, including counters, bottle tops, sticks, stones, and other local materials available offer pupils practical opportunities to manipulate quantities when learning mathematical operations. By combining different materials, pupils get to understand addition, and by taking away objects, they will be able to understand subtraction. Thus, concrete experience seems to be a vital base for the development of conceptual understanding before pupils become familiar with abstract numbers and signs. The above viewpoint is supported by the Piagetian cognitive

development theory that suggests that young learners learn effectively through manipulating concrete materials and interacting with the environment. The above finding supports the findings of Mustika et al. (2025) regarding the effectiveness of concrete manipulatives in developing early numeracy skills.

Visual representations improve pupils' ability to solve addition and subtraction problems

In relation to the use of pictures, drawings, and diagrams, 19 respondents (86.4%) believed or agreed that representations enhanced pupils' capability of solving addition and subtraction problems. Out of the 19 teachers, 10 teachers (45.5%) strongly agreed whereas nine teachers (40.9%) agreed that visual representations made pupils solve addition and subtraction problems better, while two respondents (9.1%) were neutral and one teacher (4.5%) disagreed. From the above statement, it is clear that representation enables pupils to make links between handling of actual quantities and mathematical symbols. For instance, when pupils use counters for solving problems, they can draw the exact amount and operation performed on paper, which makes them visualize the mathematical operation. Representations can henceforth enhance the performance of pupils and make them solve addition and subtraction problems without the need for actual quantities. On the other hand, another interviewee highlighted that:

"The CRA approach is helpful since pupils are not directly introduced to numbers and symbols. First, teachers let pupils use actual objects then represent them through drawings or pictures before solving addition and subtraction problems involving numbers." (Interviewee 'A' June 2026)

This is evident in the sense that it is beneficial for students to be slowly transitioned from handling real objects to using images and finally mathematical numbers and symbols. In this case, it will help the students make a connection between the physical quantities, their visualizations, and mathematical concepts. The answer agrees with the Constructivist Learning Theory which states that learning is an active process through which children learn and construct their knowledge. The representation stage makes it easy for children to relate concrete experiences with mathematical concepts before abstract reasoning. It also agrees with Mustika et al. (2025).

Progression from concrete materials to abstract symbols improves mathematical understanding

The results further show that 19 teachers (86.4%) agreed or strongly agreed that moving systematically from concrete materials to abstract mathematical symbols improved pupils' understanding of addition and

subtraction while two teachers (9.0%) disagreed and one (4.5%) was neutral. This suggests the benefits of CRA's sequential approach. When learning processes require pupils to move to the abstract level of understanding, teachers do not introduce equations and symbols to pupils directly. Instead, they provide pupils with practical experience with subsequent use of visual representations and guide the latter to solve mathematical problems with numbers and symbols. These approaches may promote pupils' understanding the meaning of mathematical operations and reduce their reliance on memorization or rote procedures. During the interview, one of the respondents asserted that:

"I have noticed that pupils make fewer mistakes when teachers follow the CRA sequence. They first understand quantities using objects and pictures, and later they can apply the same understanding when working with mathematical symbols. Pupils therefore do not simply guess answers; they understand why an addition or subtraction procedure produces a particular answer." (Interview 'C' June 2026)

This suggests that pupils make fewer errors when performing addition and subtraction because they first develop their understanding of quantities and subsequently apply mathematical symbols and procedures. Pupils are more likely to understand the reasoning behind an answer than simply guess or memorize procedures. Such a finding reflects Piaget's constructivist perspective that children develop understanding through active engagement with learning materials rather than through passive reception of information. It also aligns with the empirical evidence reviewed by García-Moya and González-Ruiz (2022), which illustrated the value of using CRA-Integrated instruction in developing young learners' addition and subtraction skills. The document further highlights that concrete and interactive experiences can enhance conceptual understanding prior to engaging in abstract operations.

The CRA approach improves pupils' accuracy in addition and subtraction

The results show that 19 teachers (86.4%) were in agreement or strong agreement that the CRA strategy enhanced the accuracy of students in addition and subtraction. In this case, 10 teachers (45.5%) were in agreement while 9 teachers (40.9%) were in strong agreement while two teachers (9.1%) disagreed while one teacher (4.5%) was neutral on the issue. The results imply that students can perform mathematical tasks accurately when they have knowledge of mathematical operations in concrete and visual terms

as they will be able to use the correct procedures to perform abstract mathematical tasks.

“CRA is effective if teachers help pupils through the different stages systematically. Pupils who are capable of manipulating objects on their own while some require demonstration and questions before comprehending the tasks. It is necessary for teachers to know these differences and give support until pupils get confidence to perform the tasks independently.” (Interview, 2026)

This shows that the efficiency of CRA is not solely dependent on providing pupils with learning resources, but teachers must help learners through all three phases. Pupils differ in their capacity to work with resources, representations, and abstract symbols. Thus, the teachers have to provide assistance in form of explanations, demonstrations, and questions until the pupils become competent in carrying out addition and subtraction on their own. This statement is strongly confirmed by the theory of the Zone of Proximal Development, where Vygotsky asserts that learners are capable of achieving much more with the help of proper assistance from more knowledgeable persons than without any. Scaffolding and guided practice are mentioned as forms of assistance in the study's theoretical framework. The finding also confirms the statements made by Bang et al. (2023) about the significance of integrating mathematical interventions into classroom practice.

Regular use of CRA enhances pupils' confidence and participation

Finally, 18 teachers (81.8%) agreed or strongly agreed that regular use of the CRA approach enhanced pupils' confidence and participation during addition and subtraction activities, with 9 teachers (40.9%) agreeing and another 9 (40.9%) strongly agreeing. Two teachers (9.1%) disagreed, while two (9.1%) remained neutral. This finding indicates that hands-on and visual activities may make mathematics more accessible and encourage pupils to participate actively in classroom activities. Pupils who were allowed to manipulate objects, draw representations, and gradually solve mathematical problems may become more confident in explaining and demonstrating their answers. Another respondent stated that:

“Pupils become more willing to participate when mathematics lessons involve materials that they can touch, move, and arrange. Even pupils who are normally quiet begin answering questions and demonstrating solutions to their classmates. As they successfully solve simple problems using objects and pictures, their confidence

increases and they become more interested in addition and subtraction.” (interviewee 'D' June 2026)

This means that CRA would make teaching of mathematics more lively since pupils get a chance to manipulate, touch, rearrange and move their learning materials. This is likely to motivate pupils who normally stay quiet to join in classroom discussion and demonstration. Positive experiences through concrete and visual activities are also likely to build confidence among pupils when solving problems of additions and subtractions. This finding confirms Kolb's theory of experiential learning, which focuses on learning through concrete experience, reflection, conceptualization and experimentation. CRA provides learners with opportunities to experience mathematics practically before applying concepts symbolically. The literature reviewed in the study also indicates that learner-centered and interactive strategies promote engagement and conceptual understanding among young learners. Furthermore, Mtebe and Christina (2024) found that locally developed mathematics games enhanced learners' engagement, motivation, and conceptual understanding, demonstrating the wider value of active learning approaches.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study has established that the application of the Concrete-Representational-Abstract (CRA) method was efficient in developing the ability of the pupils to solve problems involving addition and subtraction at the early grades level in the Ubungu Municipality. The research findings indicate that the use of concrete objects, representation, and gradual movement to the abstraction of mathematical symbols enhanced conceptual understanding, accuracy, confidence and involvement of the pupils in the mathematical learning process. Moreover, the qualitative findings reveal that guidance and scaffolding of the teachers were critical in facilitating the successful transition of the pupils through the CRA phases. Nevertheless, the study also revealed that lack of adequate recent professional development on the part of the teachers may constitute one of the limitations of the efficient implementation of CRA.

Recommendations

The research recommends that there is a need for the Ministry of Education, TIE, and local education authorities to organize professional development training for teachers of early grades in regard to how to effectively implement the CRA instructional approach. Schools are advised to make available and effectively use concrete and visual mathematics materials, including locally sourced materials. The process of guiding children from the concrete phase, through visuals to abstraction should be done in an effective

manner, where scaffolding is done as per individual pupils' needs. More research is needed on the effectiveness of CRA approach by sampling more participants and using experiments and quasi-experiments.

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